

DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

LAST UPDATE SEPTEMBER 2005

The following documentation of EI determinations for Fort Lewis only applies to that portion of the facility being addressed under RCRA Corrective Action and does not address the portion of the facility being addressed under the CERCLA program.

NOTE: Previous EI determinations for this facility were made separately for two subareas; a "Fort Lewis North" subarea representing the area of the Fort north of Interstate 5 and a "Fort Lewis South" subarea representing the area of the Fort located south of Interstate 5. This updated EI determination integrates both subareas into a single facility-wide EI determination. This reflects that both the human exposure and groundwater EI is now at "yes" facility wide and there is no longer any reason to track the progress separately for each of the previous subareas.

RCRA Corrective Action Environmental Indicator (EI) RCRIS code (CA725)

Current Human Exposures Under Control

Facility Name: US Army HQ I Corps & Fort Lewis
Facility Address: Fort Lewis, Washington, 98433
Facility EPA ID #: WA9 21405 3465

1. Has **all** available relevant/significant information on known and reasonably suspected releases to soil, groundwater, surface water/sediments, and air, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

 X If yes - check here and continue with #2 below.

 If no - re-evaluate existing data, or

 if data are not available skip to #6 and enter "IN" (more information needed) status code.

EI determinations are intended to be a "snapshot" of current site conditions, and should NOT require additional data to be gathered at the time an EI determination is made. Even if available data are clearly insufficient to determine the nature and extent of contamination or whether cleanup standards are met, it is perfectly acceptable to check "yes" for question #1 as long as whatever data currently available has been considered. When data currently available are considered but are insufficient for EI determinations, such a conclusion should be indicated in question 3 for pathways and question 4 for exposures.

Note: Even though only currently available data should be used for EI determinations, the process of making EI determinations may well identify data gaps that need to be filled through the corrective action process.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

A positive “Current Human Exposures Under Control” EI determination (“YE” status code) indicates that there are no “unacceptable” human exposures to “contamination” (i.e., contaminants in concentrations in excess of appropriate risk-based levels) that can be reasonably expected under current land- and groundwater-use conditions (for all “contamination” subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The “Current Human Exposures Under Control” EI are for reasonably expected human exposures under current land- and groundwater-use conditions ONLY, and do not consider potential future land- or groundwater-use conditions or ecological receptors. The RCRA Corrective Action program’s overall mission to protect human health and the environment requires that Final remedies address these issues (i.e., potential future human exposure scenarios, future land and groundwater uses, and ecological receptors).

El Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

2. Are groundwater, soil, surface water, sediments, or air **media** known or reasonably suspected to be **“contaminated”**¹ above appropriately protective risk-based “levels” (applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action (from SWMUs, RUs or AOCs)?

In many cases, available sampling and analytical data will be insufficient to fully document whether or not contaminant levels in the various media are above or below appropriate risk-based levels. For purposes of making EI determinations, it is entirely appropriate to use sound professional judgement as to whether particular media are or are not contaminated. For example, at a site with metal contamination in groundwater, professional judgement could easily be used to determine that no air (indoor or outdoor) contamination had occurred. This is particularly important when a phased approach is used for site characterization or corrective action - if characterization of a particular portion of a site has been deferred under a phased approach on the basis that that area is not believed to be contaminated and this belief is reasonably supported by an analysis of historical activities, process knowledge or other information, then it is quite reasonable to conclude that media in that area are not “contaminated” as part of a site-wide EI determination. Should data contradicting the initial phased-investigation presumption be gathered later in the site characterization process, it can easily be reflected in an updated EI determination. Deferral of a particular area as being low priority but still or likely to be contaminated should be reflected by a “no” or “in” EI.

	Yes	No	? Rationale / Key Contaminants (see below)
Groundwater	<u>x</u>	_____	<u>total petroleum hydrocarbons (TPH), benzene</u>
Air (indoors) ²	_____	<u>x</u>	_____
Surface Soil (e.g., <2 ft)	<u>x</u>	_____	<u>lead, TPH, benzene</u>
Surface Water	_____	<u>x</u>	_____
Sediment	_____	<u>x</u>	_____
Subsurf. Soil (e.g., >2 ft)	<u>x</u>	_____	<u>lead, TPH, benzene</u>

The rationale/key contaminants should have a brief note of the “principle threat” contaminants (those that most significantly drive cleanup decisions), as well as a reference to key documents, if any. A note as to which particular risk-based standard is being used as the basis of comparison should also be included. For complex documents, a note to the particular section, table, etc. from which data or standards are selected should be provided, as it is often difficult to verify data out of context.

Rationale and Reference(s) (Item 2)

The RCRA Facility Assessment conducted in 1997 and subsequent site investigations conducted by Fort Lewis for this project have identified releases of total petroleum hydrocarbons, benzene, and lead from SWMUs and AOCs to surface and subsurface soils. Results of investigations of several former ranges show high concentrations of lead in former firing ranges at Miller Hill and Engineer Bluff. Significant concentrations of lead were also found in a berm at the former Evergreen Infiltration (firing) Range. Results of a site investigation of a former (skeet) range provided to Ecology in March 2004, indicate concentrations of lead in surface and subsurface soils in excess of the risk-based MTCA cleanup level for this constituent. Results of previous and recent investigations show lead in surface soils resulting from the use of lead-based paint at various multifamily residences (ref. "Draft Final Residential Lead-Soil Sampling for Housing Privatization Activities", April 2002 and documentation provided September 28, 2005 in email from Paul Steucke to Leon Wilhelm and related CD hand-delivered September 29, 2005). Results of earlier investigations of several heating oil and underground storage tanks have identified TPH in subsurface soils and groundwater due to releases from these tanks (ref. Appendix D in 'draft final' remedial investigation work plan, June, 2004). There is no information indicating that surface water, sediment, indoor or outdoor air are impacted from known or potential releases.

Footnotes:

¹ "Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriately protective risk-based "levels" (for the media, that identify risks within the acceptable risk range).

² Recent evidence (from the Colorado Dept. of Public Health and Environment, and others) suggest that unacceptable indoor air concentrations are more common in structures above groundwater with volatile contaminants than previously believed. This is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration necessary to be reasonably certain that indoor air (in structures located above (and adjacent to) groundwater with volatile contaminants) does not present unacceptable risks.

3. Are there **complete pathways** between "contamination" and human receptors such that exposures can be reasonably expected under the current (land- and groundwater-use) conditions?

 X If no (pathways are not complete for any contaminated media-receptor combination) - skip to #6, and enter "YE" status code, after explaining and/or referencing condition(s) in-place, whether natural or man-made, preventing a complete exposure pathway from each contaminated medium (e.g., use optional Pathway Evaluation Work Sheet to analyze major pathways).

 If yes (pathways are complete for any "Contaminated" Media - Human Receptor combination) - continue after providing supporting explanation.

 If unknown (for any "Contaminated" Media - Human Receptor combination) - skip to #6 and enter "IN" status code

Summary Exposure Pathway Evaluation Table

Potential **Human Receptors** (Under Current Conditions)

"Contaminated" Media Residents Workers Day-Care Construction Trespassers Recreation Public

Groundwater	<u>no</u>	<u>no</u>	<u>no</u>	<u>no</u>	<u>no</u>	<u>no</u>	<u>no</u>
Air (indoors)	<u>no</u>	<u>no</u>	<u>no</u>	<u>no</u>	<u>no</u>	<u>no</u>	<u>no</u>
Soil (surface, e.g., <2 ft)	<u>no</u>	<u>no</u>	<u>no</u>	<u>no</u>	<u>no</u>	<u>no</u>	<u>no</u>
Soil (subsurface e.g., >2 ft)	<u>no</u>	<u>no</u>	<u>no</u>	<u>no</u>	<u>no</u>	<u>no</u>	<u>no</u>

Instructions for Summary Exposure Pathway Evaluation Table:

1. Strike-out specific Media including Human Receptors' spaces for Media which are not "contaminated") as identified in #2 above.
2. enter "yes" or "no" for potential "completeness" under each "Contaminated" Media -- Human Receptor combination (Pathway).

Note: In order to focus the evaluation to the most probable combinations some potential "Contaminated" Media - Human Receptor combinations (Pathways) do not have check spaces ("___"). While these combinations may not be probable in most situations they may be possible in some settings and should be

For sediments (if not other media like surface or groundwater), exposure should consider the potential for subsistence food source exposures, in addition to traditional exposure routes such as direct contact or direct ingestion.

added as necessary.

Rationale:

Results of sampling completed in January 2001 show lead concentrations in surface soils from former firing range activities in the Miller Hill and Engineer Bluff areas significantly in excess of state cleanup levels for this constituent (Ref. Draft Final Site Investigation Report, Remedial Investigation Phase, Engineer Bluff (AOC 4-1) and Miller Hill (AOC 4-2), Fort Lewis, Washington", June 2001). However, a cyclone, barb-wire perimeter fence was installed around the contaminated portion of Miller Hill in 2004, effectively preventing public access to this area. The Fort has also installed perimeter fencing around the lead-contaminated portions of the Engineer Bluff area and, in 2004, perimeter fencing was installed around lead-contaminated portions of the former Skeet Range. Installation of this fencing has been visually confirmed by Ecology during a site inspection conducted in April 2004. Results of a recent site investigation conducted in 2004 at the Evergreen Infiltration (former) Range showed high concentrations of lead in surface and subsurface soils. However, these contaminated soils were removed in an interim remedial action completed this year (2005). Construction workers conducting excavation activities could potentially be exposed to concentrations of TPH and, in some instances, benzene in subsurface soils as well as to contaminated groundwater from identified releases from underground storage tanks in localized areas. However, all identified contaminated sites at the Fort being addressed through RCRA corrective action are mapped and are addressed in a Dig-Permit process that went into effect in November 2004 at the Fort. The Dig Permit process has been instituted to prevent any unauthorized excavation and unplanned construction at mapped contaminant sites. This includes work by housing occupants as well as by site and construction workers (ref. FL Reg. 200-1, November 2004). This process includes notification to use appropriate personal protective equipment (PPE) when performing any authorized work in identified contaminated areas. Access to the facility is tightly controlled by security checkpoints

to prevent non-authorized persons entering the facility. This prevents potential trespassers from coming into contact with contaminated surface soils and other hazards at the facility.

Results of previous and recent investigations also show lead in surface soils at various multifamily residences above the state risk-based cleanup level for lead (250 mg/kg) resulting from the historic use of lead-based paint at these sites (ref. "Draft Final Residential Lead-Soil Sampling for Housing Privatization Activities", April 2002, documentation provided to Ecology September 28, 2005 in email from Paul Steucke to Leon Wilhelm and related CD hand-delivered September 29, 2005). However, the above documentation also includes a contract statement of work for excavation and replacement with clean soils for those soils where lead concentrations exceed the federal risk-based cleanup level of 400 ppm. This work has recently been funded and a contract has been awarded for completion in FY 2006. Those soils with lead concentrations between 250 and 400 ppm will be covered with landscaping in FY 2006 (ref. September 28, 2005 email from Paul Steucke to Leon Wilhelm). The above documentation provided by Fort Lewis also includes a copy of information provided in a September newsletter to occupants of the housing areas where these lead-contaminated soils have been identified, informing them of their potential for exposure to lead and measures they can take to minimize this potential exposure. Based on this documentation, Ecology therefore considers that current human exposure to lead-contaminated soils at impacted multifamily residences is now "under control". .

There is no information that the groundwater used by Fort Lewis for its drinking water supply is impacted by identified releases or potential releases that will be addressed under RCRA corrective action. (An identified TCE plume is being separately addressed under CERCLA authorities.)

Based on the above rationale and referenced documentation, current human exposures at the Fort are now considered to be "under control" at the Fort resulting in a "yes" determination for this environmental indicator.

4. Can the **exposures** from any of the complete pathways identified in #3 be reasonably expected to be “**significant**”⁴ (i.e., potentially “unacceptable” because exposures can be reasonably expected to be: 1) greater in magnitude (intensity, frequency and/or duration) than assumed in the derivation of the acceptable “levels” (used to identify the “contamination”); or 2) the combination of exposure magnitude (perhaps even though low) and contaminant concentrations (which may be

In general, EI’s (if not cleanup standards themselves) can be met through a combination of reduction of contaminant concentrations (assuming that concentrations have been unacceptable) and (physical) engineering or institutional controls that interrupt an exposure pathway. For purposes of EI determinations, however, institutional or engineering controls do not need to have the sophistication, permanence, or legal defensibility as would be necessary for a final corrective action remedy. Rather, they need to be functional and reasonable - should the controls later be found to be no longer effective, the finding can easily be reflected in an updated EI determination.

See Semantic Alert above.

An example might be the existence of off-site groundwater contamination that might pose risks to utility workers outside of the facility boundary. In this instance, evidence of an agreement between the facility and the utility that excavations would not occur in the contaminated area without appropriate protective gear would be acceptable for meeting the human exposures controlled EI.

substantially above the acceptable “levels”) could result in greater than acceptable risks)?

_____ If no (exposures can not be reasonably expected to be significant (i.e., potentially “unacceptable”) for any complete exposure pathway) - skip to #6 and enter “YE” status code after explaining and/or referencing documentation justifying why the exposures (from each of the complete pathways) to “contamination” (identified in #3) are not expected to be “significant.”

_____ If yes (exposures could be reasonably expected to be “significant” (i.e., potentially “unacceptable”) for any complete exposure pathway) - continue after providing a description (of each potentially “unacceptable” exposure pathway) and explaining and/or referencing documentation justifying why the exposures (from each of the remaining complete pathways) to “contamination” (identified in #3) are not expected to be “significant.”

_____ If unknown (for any complete pathway) - skip to #6 and enter “IN” status code

⁴ If there is any question on whether the identified exposures are “significant” (i.e., potentially “unacceptable”) consult a human health Risk Assessment specialist with appropriate education, training and experience.

5 Can the “significant” **exposures** (identified in #4) be shown to be within **acceptable** limits?

_____ If yes (all “significant” exposures have been shown to be within acceptable limits) - continue and enter “YE” after summarizing and referencing documentation justifying why all “significant” exposures to “contamination” are within acceptable limits (e.g., a site-specific Human Health Risk Assessment).

_____ If no (there are current exposures that can be reasonably expected to be “unacceptable”)- continue and enter “NO” status code after providing a description of each potentially “unacceptable” exposure.

_____ If unknown (for any potentially “unacceptable” exposure) - continue and enter “IN” status code

Environmental Indicator (EI) RCRIS code (CA725)
Current Human Exposures Under Control

6. Check the appropriate RCRIS status codes for the Current Human Exposures Under Control EI event code (CA725), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (and attach appropriate supporting documentation as well as a map of the facility):

 X YES - Yes, "Current Human Exposures Under Control" has been verified. Based on a review of the information contained in this EI Determination, "Current Human Exposures" are expected to be "Under Control" at the US Army HQ I Corps & Fort Lewis facility, EPA ID # WA9 21405 3465, located at Fort Lewis, Washington, 98433 under current and reasonably expected conditions. This determination will be re-evaluated when the Agency/State becomes aware of significant changes at the facility.

 NO - "Current Human Exposures" are NOT "Under Control."

 IN - More information is needed to make a determination.

Completed by Original signed by Leon Wilhelm Date 9/29/2005
Leon J. Wilhelm
Environmental Engineer

Supervisor Original signed by K Seiler Date 9/29/2005
K Seiler
Section Supervisor
Department of Ecology
Southwest Regional Office

The response to this question should include a brief description of the analysis and assumptions used in arriving at whatever conclusion is reached. The description does not have to be particularly detailed, but it should allow the reader to gain a basic understanding of the reasoning employed by the decision-maker.

Locations where References may be found:

RCRA Facility Assessment and draft work plan for the RCRA facility investigation and related sampling and analysis plans and correspondence, all located in the site files for corrective action.

Contact telephone and e-mail numbers

Leon J. Wilhelm
(360) 407 - 6362
leow461@ecy.wa.gov

FINAL NOTE: THE HUMAN EXPOSURES EI IS A QUALITATIVE SCREENING OF EXPOSURES AND THE DETERMINATIONS WITHIN THIS DOCUMENT SHOULD NOT BE USED AS THE SOLE BASIS FOR RESTRICTING THE SCOPE OF MORE DETAILED (E.G., SITE-SPECIFIC) ASSESSMENTS OF RISK.

DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

LAST UPDATE SEPTEMBER 2005

The following documentation of EI determinations for Fort Lewis only applies to that portion of the facility being addressed under RCRA Corrective Action and does not address the portion of the facility being addressed under the CERCLA program.

RCRA Corrective Action Environmental Indicator (EI) RCRIS code (CA750) Migration of Contaminated Groundwater Under Control

Facility Name: US Army HQ I Corps & Fort Lewis
Facility Address: Fort Lewis, Washington, 98433
Facility EPA ID #: WA9 21405 3465

1. Has **all** available relevant/significant information on known and reasonably suspected releases to the groundwater media, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

 X If yes - check here and continue with #2 below.

 If no - re-evaluate existing data, or

 if data are not available, skip to #8 and enter "IN" (more information needed) status code.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Migration of Contaminated Groundwater Under Control" EI

A positive "Migration of Contaminated Groundwater Under Control" EI determination ("YE" status code) indicates that the migration of "contaminated" groundwater has stabilized, and that monitoring will be conducted to confirm that contaminated groundwater remains within the original "area of contaminated groundwater" (for all groundwater "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRAs). The "Migration of Contaminated Groundwater Under Control" EI pertains ONLY to the physical migration (i.e., further spread) of contaminated ground water and contaminants within groundwater (e.g., non-aqueous phase liquids or NAPLs). Achieving this EI does not substitute for achieving other stabilization or final remedy requirements and expectations associated with sources of contamination and the need to restore, wherever practicable, contaminated groundwater to be suitable for its designated current and future uses.

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

2. Is **groundwater** known or reasonably suspected to be “**contaminated**”¹ above appropriately protective “levels” (i.e., applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action, anywhere at, or from, the facility?

 X If yes - continue after identifying key contaminants, citing appropriate “levels,” and referencing supporting documentation.

_____ If no - skip to #8 and enter “YE” status code, after citing appropriate “levels,” and referencing supporting documentation to demonstrate that groundwater is not “contaminated.”

This question focuses ONLY on the movement of contaminated groundwater, not the level of contamination. A “YES” response should be arrived at if, through interpretation of groundwater flow data or sound professional judgement, groundwater contamination can be shown to not be expanding in spatial extent. It is perfectly acceptable to have a “YE” groundwater EI if:

- 1) contaminated groundwater is located off-site but not migrating further;
- 2) contaminated groundwater is contaminated above cleanup standards, but not migrating further;
- 3) natural attenuation is occurring such that the rate of attenuation (through any of the acceptable attenuation mechanisms and in accordance with EPA’s Monitored Natural Attenuation Guidance, Directive 9200.4-17 - December 1997 Use of Monitored Natural Attenuation at Corrective Action Sites) is such that the outer boundaries of the plume are not expanding.

_____ If unknown - skip to #8 and enter “IN” status code.

Rationale: Results of earlier investigations of several heating oil and underground storage tanks have identified a significant potential for total petroleum hydrocarbons in groundwater due to releases from these tanks (ref. Appendix D in ‘draft final’ remedial investigation work plan, June , 2004). Also, results of groundwater monitoring at Former Gas Station A1033 show gasoline range TPH present in groundwater.

Footnotes:

¹“Contamination” and “contaminated” describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriate “levels” (appropriate for the protection of the groundwater resource and its beneficial uses).

3. Has the **migration** of contaminated groundwater **stabilized** (such that contaminated groundwater is expected to remain within “existing area of contaminated groundwater”² as defined by the monitoring locations designated at the time of this determination)?

 X If yes - continue, after presenting or referencing the physical evidence (e.g., groundwater sampling/measurement/migration barrier data) and rationale why contaminated groundwater is expected to remain within the (horizontal or vertical) dimensions of the “existing area of groundwater contamination”²).

_____ If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the “existing area of groundwater contamination”²) - skip to #8 and enter “NO” status code, after providing an explanation.

_____ If unknown - skip to #8 and enter “IN” status code.

2 “existing area of contaminated groundwater” is an area (with horizontal and vertical dimensions) that has been verifiably demonstrated to contain all relevant groundwater contamination for this determination, and is defined by designated (monitoring) locations proximate to the outer perimeter of “contamination” that can and will be sampled/tested in the future to physically verify that all “contaminated” groundwater remains within this area, and that the further migration of “contaminated” groundwater is not occurring. Reasonable allowances in the proximity of the monitoring locations are permissible to incorporate formal remedy decisions (i.e., including public participation) allowing a limited area for natural attenuation.

Rationale: Where results of site investigations have confirmed the presence of contaminated groundwater, primarily resulting from releases of TPH from leaking underground storage tanks, there is currently no information suggesting this contaminated groundwater is migrating beyond the boundaries of these localized areas. In the case of identified contaminated groundwater at Former Gas Station A1033, the most recent monitoring results show “nondetects” at outlying monitoring wells indicating that this contaminated groundwater has stabilized.

4. Does “contaminated” groundwater **discharge** into **surface water** bodies?
- _____ If yes - continue after identifying potentially affected surface water bodies.
- X** If no - skip to #7 (and enter a “YE” status code in #8, if #7 = yes) after providing an explanation and/or referencing documentation supporting that groundwater “contamination” does not enter surface water bodies.
- _____ If unknown - skip to #8 and enter “IN” status code.

Rationale: There is no current information that identifies contaminated groundwater found in localized areas resulting from leaking underground storage tanks, contaminated soils or other sources that is discharging into a surface water body.

5. Is the **discharge** of “contaminated” groundwater into surface water likely to be “**insignificant**” (i.e., the maximum concentration³ of each contaminant discharging into surface water is less than 10 times their appropriate groundwater “level,” and there are no other conditions (e.g., the nature, and number, of discharging contaminants, or environmental setting), which significantly increase the potential for unacceptable impacts to surface water, sediments, or eco-systems at these concentrations)?
- _____ If yes - skip to #7 (and enter “YE” status code in #8 if #7 = yes), after documenting: 1) the maximum known or reasonably suspected concentration³ of key contaminants discharged above their groundwater “level,” the value of the appropriate “level(s),” and if there is evidence that the concentrations are increasing; and 2) provide a statement of professional judgement/explanation (or reference documentation) supporting that the discharge of groundwater contaminants into the surface water is not anticipated to have unacceptable impacts to the receiving surface water, sediments, or eco-system.
- _____ If no - (the discharge of “contaminated” groundwater into surface water is potentially significant) - continue after documenting: 1) the maximum known or reasonably suspected concentration³ of each contaminant discharged above its groundwater “level,” the value of the appropriate “level(s),” and if there is evidence that the concentrations are increasing; and 2) for any contaminants discharging into surface water in concentrations³ greater than 100 times their appropriate groundwater “levels,” the estimated total amount (mass in kg/yr) of each of these contaminants that are being discharged (loaded) into the surface water body (at the time of the determination), and identify if there is evidence that the amount of discharging contaminants is increasing.
- _____ If unknown - enter “IN” status code in #8.

³ As measured in groundwater prior to entry to the groundwater-surface water/sediment interaction (e.g., hyporheic) zone.

6. Can the **discharge** of “contaminated” groundwater into surface water be shown to be “**currently acceptable**” (i.e., not cause impacts to surface water, sediments or eco-systems that should not be allowed to continue until a final remedy decision can be made and implemented⁴)?

- _____ If yes - continue after either: 1) identifying the Final Remedy decision incorporating these conditions, or other site-specific criteria (developed for the protection of the site’s surface water, sediments, and eco-systems), and referencing supporting documentation demonstrating that these criteria are not exceeded by the discharging groundwater; OR 2) providing or referencing an interim-assessment,⁵ appropriate to the potential for impact, that shows the discharge of groundwater contaminants into the surface water is (in the opinion of a trained specialists, including ecologist) adequately protective of receiving surface water, sediments, and eco-systems, until such time when a full assessment and final remedy decision can be made. Factors which should be considered in the interim-assessment (where appropriate to help identify the impact associated with discharging groundwater) include: surface water body size, flow, use/classification/habitats and contaminant loading limits, other sources of surface water/sediment contamination, surface water and sediment sample results and comparisons to available and appropriate surface water and sediment “levels,” as well as any other factors, such as effects on ecological receptors (e.g., via bio-assays/benthic surveys or site-specific ecological Risk Assessments), that the overseeing regulatory agency would deem appropriate for making the EI determination.
- _____ If no - (the discharge of “contaminated” groundwater can not be shown to be “**currently acceptable**”) - skip to #8 and enter “NO” status code, after documenting the currently unacceptable impacts to the surface water body, sediments, and/or eco-systems.
- _____ If unknown - skip to 8 and enter “IN” status code.

When considering discharge of groundwater to surface water, it is important to remember that some discharges may be considered acceptable - it is not necessary to demonstrate that there are no discharges, or that groundwater meets surface water criteria at the point of discharge, as may be the case with final cleanup levels. As with human exposures controlled and other groundwater criteria, sound professional judgement may be used in evaluating the impact of groundwater to surface water.

The GW/SW component of the 750 EI really has three parts: 1) is there a discharge; 2) is the discharge insignificant; and 3) is the discharge currently acceptable (questions 4-6, respectively). A YE EI may be obtained if appropriate responses can be made through following this three-step analysis (no discharge, discharge insignificant, or discharge acceptable, respectively). Note that the level of supporting analysis and/or data increases as you progress through these three steps - a finding that a discharge is acceptable for a particular water body requires a considerably more complex analysis than a finding that there is no discharge.

Another point to recognize is that surface water issues often involve ecological risk considerations, and that such ecological evaluations often require specialized professional evaluation. Never the less, the quantity of data and effort required for analysis of groundwater/surface water EI questions should not be significantly different than what is required for human exposures or other groundwater questions. Evaluation of surface water from an EI perspective should not require a disproportionate effort.

7. Will groundwater **monitoring** / measurement data (and surface water/sediment/ecological data, as necessary) be collected in the future to verify that contaminated groundwater has remained within the horizontal (or vertical, as necessary) dimensions of the “existing area of contaminated groundwater?”

 X If yes - continue after providing or citing documentation for planned activities or future sampling/measurement events. Specifically identify the well/measurement locations which will be tested in the future to verify the expectation (identified in #3) that groundwater contamination will not be migrating horizontally (or vertically, as necessary) beyond the “existing area of groundwater contamination.”

 If no - enter “NO” status code in #8.

 If unknown - enter “IN” status code in #8.

Rationale: Where site investigations have identified areas of localized contaminated groundwater, Fort Lewis has typically conducted voluntary monitoring to verify that the contaminated groundwater in these localized areas does not migrate off the site of the release. Monitoring of identified sites with contaminated groundwater will be incorporated into a compliance monitoring plan when remedial actions have been implemented under MTCA.

**Migration of Contaminated Groundwater Under Control
Environmental Indicator (EI) RCRIS code (CA750)**

8. Check the appropriate RCRIS status codes for the Migration of Contaminated Groundwater Under Control EI (event code CA750), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (attach appropriate supporting documentation as well as a map of the facility).

 X YE - Yes, "Migration of Contaminated Groundwater Under Control" has been verified. Based on a review of the information contained in this EI determination, it has been determined that the "Migration of Contaminated Groundwater" is "Under Control" at the US Army HQ I Corps & Fort Lewis facility, EPA ID # WA9 21405 3465, located at Fort Lewis, Washington, 98433. Specifically, this determination indicates that the migration of "contaminated" groundwater is under control, and that monitoring will be conducted to confirm that contaminated groundwater remains within the "existing area of contaminated groundwater" This determination will be re-evaluated when the Agency becomes aware of significant changes at the facility.

 NO - Unacceptable migration of contaminated groundwater is observed or expected.

 IN - More information is needed to make a determination.

Completed by Original signed by Leon Wilhelm Date 9/29/2005
Leon J. Wilhelm
Environmental Engineer

Supervisor Original signed by K Seiler Date 9/29/2005
K Seiler
Section Supervisor
Department of Ecology
Southwest Regional Office

Locations where references may be found:

RCRA Facility Assessment and draft work plan for the RCRA facility investigation and related sampling and analysis plans and correspondence, all located in the site files for corrective action.

Contact telephone and e-mail numbers

Leon J. Wilhelm
(360) 407 - 6362
leow461@ecy.wa.gov